Lat 41.24390 Lon -123.48250

United States Department Of Agriculture | Forest Service | Shasta-Trinity National Forests

Reply To: 3420 Date: August 29, 1989

Subject: Evaluation of Windthrow in Stand 139, Compartment 29, Orleans Ranger District (Report No. N89-19)

To: Forest Supervisor, Six Rivers National Forest

On August 8, 1989, Dave Schultz, Entomologist, and I met with Sue MacMeeken and Tom Bouse of the Orleans Ranger District. The purpose of our visit was to examine windthrown white fir and Douglas-fir in compartment 29, stand 139 on the District. Sue is preparing a silvicultural prescription for this stand and was concerned about the cause of the windthrow and pathogens that may be present in the stand.

This 7 acre stand is in the area of the Sunrise timber sale 22 (T. 10 N., R. 6 E., section 22). It is a 2 to 3 layer stand comprised of Douglas-fir, white fir, sugar pine, ponderosa pine, and tanoak. Some predominants, mainly ponderosa pine, are in the stand. The majority of the stocking in the overstory is Douglas-fir and white fir, with some sugar pine. The understory is white fir, Douglas-fir, and tanoak, with white fir advanced regeneration. The adjacent area was harvested about 20 years ago and planted with Douglas-fir. A skid road separates this plantation and stand 139. No past harvesting activity has occurred in stand 139, except for some salvage along the skid road.

Several large Douglas-firs and white firs were windthrown during the winter of 1989. These trees were along the skid road next to the adjacent regenerated stand. Examination of the root systems of these trees revealed that they had little solid wood left at the time of failure. The larger structural roots had advanced white rot of the wood. Evidence of shoestring root rot, caused by Armillaria sp., was found in the roots of these trees. This included old mycelial fans and rhizomorphs in the cambium area and zone lines in the wood. No recent standing tree mortality was in the area. A group of older dead trees was in the vicinity, but the cause could not be determined because of their advanced deterioration. Dwarf mistletoe witches' brooms (Arceuthobium douglasii) were present in the Douglas-fir in the stand. No other pest was causing damage.

BIOLOGY OF ARMILLARIA ROOT DISEASE

The taxonomy of Armillaria spp. has undergone significant revision the past several years with the identification of pathogenic and saprophytic "strains". At present, we do not know what species are present in California forests, although it is believed that both pathogenic and saprophytic forms exist. The hosts of this fungus include most woody species commonly found in California forests, including white fir and Douglas-fir. There does appear to be variation

in host susceptibility. The true firs and Douglas-fir appear to be more susceptible than ponderosa pine.

The mechanism of initial infection by Armillaria sp. is not known. However, the fungus is common enough in woody material in the soil that its presence is not a limiting factor when a susceptible host becomes available. The fungus produces black, shoestring-like rhizomorphs that grow through soil and penetrate the bark of roots. In addition to rhizomorphs, Armillaria can spread between trees through root contacts. Healthy trees may be able to wall off initial infections. Less vigorous trees may not be able to stop the growth of the fungus, especially if the fungus is originating from a sizable food source. Once established, Armillaria grows in the cambium and inner bark by producing mycelial fans. The cambium is killed in advance of these fans. The woody tissue behind the advancing front provides the food base for the fungus as the wood is decayed. Armillaria can survive in large woody tissues for several decades.

MANAGEMENT ALTERNATIVES

1. No Action. Armillaria will not cause a significant problem in this stand. Additional windthrow will occur in the vicinity of the root disease pocket along the edge of the stand. This woody material will eventually deteriorate and recycle into the soil. Some damage may occur to standing trees when a tree fails. Spread of the disease and expansion of the pocket will be slow. Naturally regenerated Douglas-fir and white fir in the pocket may be killed by the fungus. Additional Armillaria root disease centers will not develop in the stand. Douglas-fir regeneration in the stand will be infected by dwarf mistletoe and will be adversely affected as far as tree growth and form.

2. Salvage, Regenerate in 10-15 Years. Readily accessible dead and windthrown trees would be salvaged. The remainder of the stand would be left undisturbed for 10-15 years to accumulate volume and to provide time for the adjacent regenerated stand to increase in size. Some additional windthrow can be expected in the root disease pocket. This may be salvaged if economical, otherwise the wood will deteriorate on site. In 10-15 years, the stand would be harvested and regenerated. To reduce the possible impact of Armillaria root disease and Douglas-fir dwarf mistletoe on the next stand, the species composition should include a larger component of ponderosa pine and some sugar pine (not to exceed 10%) than in the present stand. These species appear to be more resistant to the root disease and will aid in disrupting any root to root spread. They also are immune to this species of dwarf mistletoe.

3. Regenerate. The stand would be clearcut and regenerated within the next several years. The useable volume from dead and windthrown trees would be recovered. Future windthrow would be recovered as green timber. The comments in #2 about planting stock would be applicable.

If you have any questions about this report or need further assistance, please contact Gregg DeNitto or Dave Schultz at (916)246-5101.

GREGG DeNITTO
Forest Pathologist
FPM Northern CA Service Area